



SEQUENCE LISTING

<110> MARKS, JAMES D.
AMERSDORFER, PETER

<120> THERAPEUTIC MONOCLONAL ANTIBODIES THAT NEUTRALIZE BOTULINUM
NEUROTOXINS

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<140> US 10/632,706
<141> 2003-08-01

<150> US 60/400,721
<151> 2002-08-01

<150> US 09/144,806
<151> 1998-08-31

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<170> PatentIn version 3.2

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Gln Val Lys Leu Gln Gln Ser Gly Ala Glu Leu Val Arg Pro Gly Ala
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Ser Val Lys Leu Ser Cys Lys Thr Ser Gly Tyr Ser Phe Thr Ser Tyr
20 25 30

Trp Met Asn Trp Val Lys Gln Gly Pro Gly Gln Gly Leu Glu Trp Ile
35 40 45

Gly Met Ile His Pro Ser Asn Ser Glu Ile Arg Phe Asn Gln Lys Phe
50 55 60

Glu Asp Met Ala Thr Leu Thr Val Asp Lys Ser Ser Ser Thr Ala Tyr
65 70 75 80

Met Gln Leu Ser Ser Pro Thr Ser Glu Asp Ser Ala Val Tyr Tyr Cys
85 90 95

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Ala Arg Gly Ile Tyr Tyr Asp Tyr Asp Gly Gly Asn Tyr Tyr Ala Met
100 105 110

Asp Tyr Trp Gly Gln Gly Thr Thr Val Thr Ala Ser Ser
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Gln Val Lys Leu Gln Gln Ser Gly Ala Glu Leu Val Arg Pro Gly Ala
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Ser Val Lys Leu Ser Cys Lys Thr Ser Gly Tyr Ser Phe Thr Ser Tyr
20 25 30

Trp Met Asn Trp Val Lys Gln Gly Pro Gly Gln Gly Leu Glu Trp Ile
35 40 45

Gly Met Ile His Pro Ser Asn Ser Glu Ile Arg Phe Asn Gln Lys Phe
50 55 60

Glu Asn Met Ala Thr Leu Thr Val Asp Lys Ser Ser Ser Thr Ala Tyr
65 70 75 80

Met Gln Leu Ser Ser Pro Thr Ser Glu Asp Ser Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Gly Ile Tyr Tyr Val Tyr Asp Gly Gly Asn Thr Thr Ala Met
100 105 110

Asp Tyr Trp Gly Gln Gly Thr Thr Val Thr Val Ser Ser
115 120 125

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<400> 50

Glu Val Lys Leu Val Glu Ser Gly Ala Glu Leu Val Arg Pro Gly Ala
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Ser Val Asn Leu Ser Cys Lys Ala Ser Gly Tyr Ser Phe Thr Ser Tyr
20 25 30

Trp Met Asn Trp Val Lys Gln Arg Pro Gly Gln Gly Leu Glu Trp Ile
35 40 45

Gly Met Ile His Pro Ser Asn Ser Glu Thr Arg Leu Asn Gln Lys Phe
50 55 60

Lys Asp Lys Ala Thr Leu Thr Val Asp Lys Ser Ser Ser Thr Ala Tyr
65 70 75 80

Met Gln Leu Ser Ser Pro Thr Ser Glu Asp Ser Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Gly Ile Tyr Tyr Asp Tyr Asp Glu Gly Tyr Tyr Tyr Thr Leu
100 105 110

Asp Tyr Trp Gly Gln Gly Thr Thr Leu Thr Val Ser Ser
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Ser Val Lys Leu Ser Cys Lys Ala Ser Gly Tyr Ser Phe Thr Ser Tyr
20 25 30

Trp Met Asn Trp Val Lys Gln Arg Pro Gly Gln Gly Leu Glu Trp Ile
35 40 45

Gly Met Ile His Pro Ser Asn Ser Asp Thr Arg Phe Asn Gln Lys Phe
50 55 60

Glu Asp Lys Ala Thr Leu Thr Val Asp Arg Ser Ser Ser Thr Ala Ile
65 70 75 80

His Gln Leu Ser Ser Pro Thr Ser Glu Asp Ser Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Gly Leu Tyr Gly Tyr Gly Phe Trp Tyr Phe Asp Val Trp Gly
100 105 110

Gln Gly Thr Thr Val Thr Val Ser Ser
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Ser Val Lys Leu Ser Cys Lys Ala Ser Gly Tyr Ser Leu Thr Ser Tyr
20 25 30

Trp Met Asn Trp Val Lys Gln Arg Pro Gly Gln Gly Leu Glu Trp Ile
35 40 45

Gly Met Ile His Pro Ser Asp Ser Asp Thr Arg Phe Asn Gln Lys Phe
50 55 60

Glu Asp Lys Ala Thr Leu Thr Val Asp Thr Ser Ser Ser Thr Ala Tyr
65 70 75 80

Met Gln Leu Ser Ser Pro Thr Ser Glu Asp Ser Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Gly Leu Tyr Asn Gly Phe Trp Tyr Phe Asp Val Trp Gly Gln
100 105 110

Gly Thr Thr Val Thr Val Ser Ser
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Ser Val Lys Ile Ser Cys Lys Ala Ser Gly Tyr Thr Phe Ile Asp Tyr
20 25 30

Ala Met His Trp Val Lys Gln Ser Pro Ala Lys Ser Leu Glu Trp Ile
35 40 45

Gly Val Ile Ser Ser Tyr Tyr Gly Asp Thr Asp Tyr Asn Gln Ile Phe
50 55 60

Lys Gly Lys Ala Thr Leu Thr Val Asp Lys Ser Ser Asn Thr Ala Tyr
65 70 75 80

Met Glu Leu Ala Arg Leu Thr Ser Asp Asp Ser Ala Ile Tyr Tyr Cys
85 90 95

Ala Arg Arg Gly Lys Gly Ala Met Asp Tyr Trp Gly Gln Gly Thr Thr
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Val Thr Val Ser Ser
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Ser Val Lys Ile Ser Cys Lys Ala Ser Gly Tyr Thr Phe Ile Asp Tyr
20 25 30

Ala Val His Trp Val Lys Gln Ser His Ala Lys Ser Leu Glu Trp Ile
35 40 45

Gly Val Ile Ser Thr Tyr Tyr Gly Asp Ala Asp Tyr Asn Pro Lys Phe
50 55 60

Lys Gly Lys Ala Thr Leu Thr Val Asn Lys Ser Ser Asn Thr Ala Tyr
65 70 75 80

Met Glu Leu Pro Arg Leu Thr Ser Glu Asp Ser Ala Ile Tyr Tyr Cys
85 90 95

Ala Arg Arg Gly Lys Gly Ala Met Asp Tyr Trp Gly Gln Gly Thr Ser
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Val Thr Val Ser Ser
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Ser Leu Ser Leu Thr Cys Thr Val Thr Gly Tyr Ser Ile Thr Asp Tyr
20 25 30

Ala Trp Asn Trp Ile Arg Gln Phe Pro Gly Lys Lys Leu Glu Trp Met
35 40 45

Gly Tyr Ile Ser Tyr Ser Gly Ser Thr Gly Tyr Asn Pro Ser Leu Lys
50 55 60

Ser Arg Ile Ser Ile Thr Arg Asp Thr Ser Lys Asn Gln Phe Phe Leu
65 70 75 80

Gln Leu Asn Ser Val Thr Thr Glu Asp Thr Gly Thr Tyr Tyr Cys Ala
85 90 95

Arg Gly Tyr Asp Ala Met Asp Tyr Trp Gly Gln Gly Thr Ser Val Thr
100 105 110

Val Ser Ser
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Ser Leu Ser Leu Thr Cys Thr Val Thr Gly Tyr Ser Ile Thr Asp Tyr
20 25 30

Ala Trp Tyr Trp Ile Arg Gln Phe Pro Gly Lys Lys Leu Glu Trp Met
35 40 45

Gly Tyr Ile Ser Tyr Ser Gly Ser Thr Gly Tyr Asn Pro Ser Leu Lys
50 55 60

Ser Arg Ile Ser Ile Thr Arg Asp Thr Ser Lys Asn Gln Phe Phe Leu
65 70 75 80

Gln Leu Asn Ser Val Thr Thr Glu Asp Thr Gly Thr Tyr Tyr Cys Ala
85 90 95

Arg Gly Tyr Asp Ala Met Asp Tyr Trp Gly Gln Gly Thr Ser Val Thr
100 105 110

Val Ser Ser
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Ser Arg Lys Leu Ser Cys Ala Thr Ser Gly Phe Thr Phe Ser Asp Tyr
20 25 30

Tyr Met Ser Trp Ile Arg Gln Ser Pro Asp Lys Arg Leu Glu Trp Val
35 40 45

Ala Thr Ile Ser Asp Gly Gly Thr Tyr Thr Tyr Tyr Pro Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Thr Leu Tyr
65 70 75 80

Leu Gln Met Ser Ser Leu Lys Ser Glu Asp Thr Ala Met Tyr Tyr Cys
85 90 95

Val Arg His Gly Tyr Gly Asn Tyr Pro Ser His Trp Tyr Phe Asp Val
100 105 110

Trp Gly Ala Gly Thr Thr Val Thr Val Ser Ser
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Glu Val Lys Leu Val Glu Ser Gly Gly Gly Leu Val Gln Pro Gly Gly
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Ser Leu Lys Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Asn Tyr
20 25 30

Gly Met Ser Trp Val Arg Gln Thr Pro Asp Lys Arg Leu Glu Trp Val
35 40 45

Ala Met Ile Ser Ser Gly Gly Ser Tyr Asn Tyr Tyr Ser Asp Ser Val
50 55 60

Lys Gly Arg Val Thr Ile Ser Arg Asp Asn Ala Lys Ser Thr Leu Tyr
65 70 75 80

Leu Gln Met Ser Ser Leu Gln Ser Glu Asp Thr Ala Met Tyr Leu Cys
85 90 95

Thr Arg His Gly Tyr Gly Asn Tyr Pro Ser Tyr Trp Tyr Phe Asp Val
100 105 110

Trp Gly Ala Gly Thr Thr Val Thr Val Ser Ser
115 120

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Ser Leu Lys Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Asp Tyr
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Tyr Met Ser Trp Val Arg Gln Thr Pro Glu Lys Arg Leu Glu Trp Val
35 40 45

Ala Thr Ile Ser Asp Gly Gly Ser Tyr Thr Tyr Tyr Pro Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Asn Leu Tyr
65 70 75 80

Leu Gln Met Ser Ser Leu Lys Ser Glu Asp Thr Ala Ile Tyr Tyr Cys
85 90 95

Val Arg Tyr Arg Tyr Asp Glu Gly Leu Asp Tyr Trp Gly Gln Gly Thr
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Thr Val Thr Val Ser Ser
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Ser Leu Lys Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Asp Tyr
20 25 30

Tyr Met Tyr Trp Val Arg Gln Thr Pro Glu Lys Arg Leu Glu Trp Val
35 40 45

Ala Thr Ile Ser Asp Gly Gly Ser Tyr Thr Tyr Tyr Pro Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys Asn Asn Leu Tyr
65 70 75 80

Leu Gln Met Ser Ser Leu Lys Ser Glu Asp Thr Ala Met Tyr Tyr Cys
85 90 95

Ser Arg Tyr Arg Tyr Asp Asp Ala Met Asp Tyr Trp Gly Gln Gly Thr
100 105 110

Thr Val Thr Val Ser Ser
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Glu Val Lys Leu Val Glu Ser Gly Gly Gly Leu Val Lys Pro Gly Gly
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Ser Leu Lys Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met Ser Trp Val Arg Gln Thr Pro Glu Lys Arg Leu Glu Trp Val
35 40 45

Ala Thr Ile Ser Asp Gly Gly Thr Tyr Thr Tyr Tyr Thr Asp Asn Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys His Asn Leu Tyr
65 70 75 80

Leu Gln Met Ser His Leu Lys Ser Glu Asp Thr Ala Met Tyr Tyr Cys
85 90 95

Ala Arg Asn Leu Pro Tyr Asp His Val Asp Tyr Trp Gly Gln Gly Thr
100 105 110

Ser Val Thr Val Ser Ser
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Glu Val Lys Leu Lys Glu Ser Gly Gly Gly Leu Val Lys Pro Gly Gly
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Ser Leu Lys Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met Ser Trp Val Arg Gln Thr Pro Glu Lys Arg Leu Glu Trp Val
35 40 45

Ala Thr Ile Ser Asp Gly Gly Thr Tyr Thr Tyr Tyr Thr Asp Asn Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys His Asn Leu Tyr
65 70 75 80

Leu Gln Met Ser His Leu Lys Ser Glu Asp Thr Ala Met Tyr Tyr Cys
85 90 95

Ala Arg Asn Leu Pro Tyr Asp His Val Asp Tyr Trp Gly Gln Gly Thr
100 105 110

Ser Val Thr Val Ser Ser
115

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<400> 63

His Gly Lys Leu Val Glu Ser Gly Gly Leu Val Lys Pro Gly Gly
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Ser Leu Lys Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met Ser Trp Val Arg Gln Thr Pro Glu His Arg Leu Glu Trp Val
35 40 45

Ala Thr Ile Ser Asp Gly Gly Thr Phe Thr Tyr Tyr Thr Asp Asn Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys His Asn Leu Tyr
65 70 75 80

Leu Gln Met Ser His Leu Lys Ser Glu Asp Thr Ala Met Tyr Tyr Cys

85

90

95

Ala Arg Asn Leu Pro Tyr Asp His Val Asp Tyr Trp Gly Gln Gly Thr
100 105 110

Ser Val Thr Val Ser Ser
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<400> 64

Glu Val Lys Leu Val Glu Ser Gly Gly Leu Val Lys Pro Gly Gly
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Pro Leu Lys Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met Ser Trp Val Arg Gln Thr Pro Glu His Arg Leu Glu Trp Val
35 40 45

Ala Thr Ile Ser Asp Gly Gly Thr Phe Thr Tyr Tyr Thr Asp Asn Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ala Lys His Asn Leu Tyr
65 70 75 80

Leu Gln Met Ser His Leu Lys Ser Glu Asp Thr Ala Met Tyr Tyr Cys
85 90 95

Ala Arg Asn Leu Pro Tyr Asp His Val Asp Tyr Trp Gly Gln Gly Thr
100 105 110

Ser Val Thr Val Ser Ser
115

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Glu Val Gln Leu Gln Glu Ser Gly Gly Val Val Gln Pro Gly Arg
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Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val
35 40 45

Ala Val Ile Ser Tyr Asp Gly Ser Asn Lys Tyr Tyr Ala Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Asp Trp Ser Glu Gly Tyr Tyr Tyr Gly Met Asp Val Trp
100 105 110

Gly Gln Gly Thr Thr Val Ile Val Ser Ser
115 120

<210> 66

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<400> 66

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Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser Ser Tyr
20 25 30

Ala Met His Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val

35

40

45

Ala Val Ile Ser Tyr Asp Gly Ser Asn Lys Tyr Tyr Ala Asp Ser Val
50 55 60

Lys Gly Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr
65 70 75 80

Leu Gln Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Asp Trp Ser Glu Gly Tyr Tyr Tyr Gly Met Asp Val Trp
100 105 110

Gly Gln Gly Thr Thr Val Ile Val Ser Ser
115 120

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<220>
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<400> 67

Val Lys Leu Val Glu Ser Gly Pro Gly Leu Val Lys Pro Ser Gln Ser
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Leu Ser Leu Thr Cys Thr Val Thr Gly Tyr Ser Ile Thr Ser Asp Tyr
20 25 30

Ala Trp Asn Trp Ile Arg Gln Phe Pro Gly Asn Lys Leu Glu Trp Met
35 40 45

Gly Tyr Ile Asn Tyr Asp Gly Ser Asn Asn Tyr Asn Pro Ser Leu Lys
50 55 60

Asn Arg Ile Ser Ile Thr Arg Asp Thr Ser Lys Asn Gln Phe Phe Leu
65 70 75 80

Lys Leu Asn Ser Val Thr Ser Glu Asp Thr Ala Thr Tyr Tyr Cys Ala
85 90 95

Arg Ala Gly Asp Gly Tyr Tyr Val Asp Trp Tyr Phe Asp Val Trp Gly
100 105 110

Thr Gly Thr Thr Val Ile Val Ser Ser
115 120

<210> 68
<211> 117
<212> PRT
<213> Artificial

<220>
<223> single chain antibody

<400> 68

Gln Val Gln Leu Gln Gln Ser Gly Ala Glu Leu Val Gln Pro Gly Ala
1 5 10 15

Ser Val Lys Met Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Asp Tyr
20 25 30

Trp Thr Thr Trp Val Lys Gln Arg Pro Gly Gln Gly Leu Glu Trp Ile
35 40 45

Gly Asp Ile Tyr Pro Gly Ser Gly Ser Thr Asn Tyr Asn Glu Lys Phe
50 55 60

Lys Ser Lys Ala Thr Leu Thr Val Asp Thr Ser Ser Ser Thr Ala Tyr
65 70 75 80

Met Gln Leu Ser Ser Leu Thr Ser Glu Asp Ser Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Glu Leu Gly Asp Ala Met Asp Tyr Trp Gly Gln Gly Thr Ser
100 105 110

Val Ile Val Ser Ser
115

<210> 69
<211> 117
<212> PRT
<213> Artificial

<220>
<223> single chain antibody

<400> 69

Glu Val Gln Leu Gln Gln Ser Gly Ala Glu Leu Val Gln Pro Gly Ala
1 5 10 15

Ser Val Lys Met Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Asp Tyr
20 25 30

Trp Thr Thr Trp Val Lys Gln Arg Pro Gly Gln Gly Leu Glu Trp Ile
35 40 45

Gly Asp Ile Tyr Pro Asp Ser Gly Ser Thr Asn Tyr Asn Glu Lys Phe
50 55 60

Lys Ser Lys Ala Thr Leu Thr Val Asp Thr Ser Ser Ser Thr Ala Tyr
65 70 75 80

Met Gln Leu Ser Ser Leu Thr Ser Glu Asp Ser Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Glu Leu Gly Asp Ala Met Asp Tyr Trp Gly Gln Gly Thr Ser
100 105 110

Val Ile Val Ser Ser
115

<210> 70

<211> 119

<212> PRT

<213> Artificial

<220>

<223> single chain antibody

<400> 70

Glu Val Gln Leu Gln Gln Ser Gly Ala Glu Leu Val Lys Pro Gly Ala
1 5 10 15

Ser Val Lys Leu Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Ser Phe
20 25 30

Trp Met His Trp Val Lys Gln Arg Pro Gly Arg Gly Leu Glu Trp Ile
35 40 45

Gly Arg Leu Asp Pro Asn Ser Gly Glu Thr Lys Tyr Asn Glu Lys Phe
50 55 60

Lys Ser Lys Ala Thr Leu Thr Val Asp Lys Pro Ser Ser Thr Ala Tyr
65 70 75 80

Met Glu Leu Ser Ser Leu Thr Ser Gly Asp Ser Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Glu Ala Tyr Gly Tyr Trp Asn Phe Asp Val Trp Gly Thr Gly
100 105 110

Thr Thr Val Thr Val Ser Ser
115

<210> 71
<211> 119
<212> PRT
<213> Artificial

<220>
<223> single chain antibody

<400> 71

Glu Val Gln Leu Gln Gln Ser Gly Ala Glu Leu Val Lys Pro Gly Ala
1 5 10 15

Ser Val Lys Leu Ser Cys Lys Ala Ser Gly Tyr Thr Phe Thr Ser Phe
20 25 30

Trp Met His Trp Val Lys Gln Arg Pro Gly Arg Gly Leu Glu Trp Ile
35 40 45

Gly Arg Leu Asp Pro Asn Ser Gly Glu Thr Lys Tyr Asn Lys Lys Phe
50 55 60

Lys Ser Lys Ala Thr Leu Thr Val Asp Lys Pro Ser Ser Thr Ala Tyr
65 70 75 80

Met Glu Leu Ser Ser Leu Thr Ser Gly Asp Ser Ala Val Tyr Tyr Cys
85 90 95

Ala Arg Glu Ala Tyr Gly Tyr Trp Asn Phe Asp Val Trp Gly Thr Gly
100 105 110

Thr Thr Val Thr Val Ser Ser
115

<210> 72
<211> 107
<212> PRT
<213> Artificial

<220>
<223> single chain antibody

<400> 72

Asp Ile Glu Leu Thr Gln Ser Pro Ala Ile Met Ser Ala Ser Pro Gly
1 5 10 15

Glu Lys Val Ile Met Thr Cys Ser Ala Ser Ser Ser Val Ser His Met
20 25 30

Tyr Trp Tyr Gln Gln Lys Pro Gly Ser Ser Pro Arg Leu Leu Ile Tyr
35 40 45

Asp Thr Ser Asn Leu Ala Ser Gln Val Pro Ile Arg Phe Ser Gly Ser
50 55 60

Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser Arg Met Glu Ala Glu
65 70 75 80

Asp Ser Ala Thr Tyr Tyr Cys Gln Gln Trp Ser Ser Tyr Pro Phe Thr
85 90 95

Phe Gly Ser Gly Thr Lys Leu Glu Leu Lys Arg
100 105

<210> 73
<211> 107
<212> PRT
<213> Artificial

<220>
<223> single chain antibody

<400> 73

Asp Ile Asp Leu Thr Gln Ser Pro Ala Ile Met Ser Ser Ser Pro Gly
1 5 10 15

Glu Lys Val Ile Ile Thr Cys Ser Ala Ser Ser Ser Val Ser Tyr Met
20 25 30

His Trp Phe Gln Gln Lys Pro Gly Thr Ser Pro Lys Pro Trp Ile Tyr
35 40 45

Ser Thr Ser Asn Leu Ala Ser Gln Val Pro Ala Arg Phe Ser Gly Ser
50 55 60

Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser Ser Val Glu Ala Glu
65 70 75 80

Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Tyr Ser Gly Tyr Pro Leu Thr
85 90 95

Phe Gly Ala Gly Thr Lys Leu Glu Ile Lys Arg
100 105

<210> 74
<211> 109
<212> PRT
<213> Artificial

<220>
<223> single chain antibody

<400> 74

Asp Ile Glu Leu Thr Gln Ser Pro Ala Ile Met Ala Ala Ser Pro Gly
1 5 10 15

Glu Lys Val Ile Ile Thr Cys Ser Ala Ser Ser Ser Ile Ser Ser Ser
20 25 30

Asn Leu His Trp Tyr Gln Gln Lys Ser Glu Thr Ser Pro Lys Pro Trp
35 40 45

Ile Tyr Gly Thr Ser Asn Leu Ala Ser Gln Val Pro Val Arg Phe Ser
50 55 60

Gly Ser Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser Ser Met Glu
65 70 75 80

Ala Glu Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Trp Gly Ser Tyr Pro
85 90 95

Leu Thr Phe Gly Gly Gly Thr Lys Leu Glu Ile Lys Arg
100 105

<210> 75
<211> 107
<212> PRT
<213> Artificial

<220>
<223> single chain antibody

<400> 75

Asp Ile Glu Leu Thr Gln Ser Pro Ala Ile Met Ser Ala Ser Pro Gly
1 5 10 15

Glu Lys Val Ile Met Thr Cys Ser Ala Ser Ser Ser Val Ser Tyr Met
20 25 30

Tyr Trp Tyr Gln Gln Lys Pro Gly Ser Ser Pro Arg Leu Leu Ile Tyr
35 40 45

Asp Thr Ser Asn Leu Ala Ser Gln Val Pro Val Arg Phe Ser Gly Ser
50 55 60

Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser Arg Met Glu Ala Glu
65 70 75 80

Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Trp Ser Ser Tyr Pro Leu Thr
85 90 95

Phe Gly Ala Gly Thr Lys Leu Glu Leu Lys Arg
100 105

<210> 76
<211> 109
<212> PRT
<213> Artificial

<220>
<223> single chain antibody

<400> 76

Asp Ile Glu Leu Thr Gln Ser Pro Ala Leu Met Ala Ala Ser Pro Gly
1 5 10 15

Glu Lys Val Ile Ile Thr Cys Ser Val Ser Ser Ser Ile Ser Ser Ser
20 25 30

Asn Leu His Trp Tyr Gln Gln Lys Ser Gly Thr Ser Pro Lys Pro Trp
35 40 45

Ile Tyr Gly Thr Ser Asn Leu Ala Ser Gln Val Pro Val Arg Phe Ser
50 55 60

Gly Ser Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser Ser Met Glu
65 70 75 80

Ala Glu Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Trp Ser Ser Tyr Pro
85 90 95

Leu Thr Phe Gly Ala Gly Thr Lys Leu Glu Ile Lys Arg
100 105

<210> 77

<211> 112

<212> PRT

<213> Artificial

<220>

<223> single chain antibody

<400> 77

Asp Ile Glu Leu Thr Gln Ser Pro Ala Ser Leu Ala Val Ser Leu Gly
1 5 10 15

Gln Arg Ala Ile Ile Ser Cys Arg Ala Tyr Glu Ser Val Asp Ser Tyr
20 25 30

Gly Asn Ser Phe Met His Trp Tyr Gln Gln Lys Pro Gly Gln Pro Pro
35 40 45

Lys Leu Leu Ile Tyr Arg Ala Ser Asn Leu Glu Ser Gln Ile Pro Ala
50 55 60

Arg Phe Ser Gly Ser Gly Ser Arg Thr Asp Phe Thr Leu Thr Ile Asn
65 70 75 80

Pro Val Glu Ala Asp Asp Val Ala Thr Tyr Tyr Cys Gln Gln Ser Asn
85 90 95

Glu Asp Pro Pro Thr Phe Gly Ala Gly Thr Lys Leu Glu Leu Lys Arg
100 105 110

<210> 78
<211> 112
<212> PRT
<213> Artificial

<220>
<223> single chain antibody

<400> 78

Asp Ile Glu Leu Thr Gln Ser Pro Ala Ser Leu Ala Val Ser Leu Gly
1 5 10 15

Gln Arg Ala Ile Ile Ser Cys Arg Ala Tyr Glu Ser Val Asp Ser Tyr
20 25 30

Gly Asn Ser Phe Met His Trp Tyr Gln Gln Lys Pro Gly Gln Pro Pro
35 40 45

Lys Leu Leu Ile Tyr Arg Ala Ser Asn Leu Glu Ser Gln Ile Pro Ala
50 55 60

Arg Phe Ser Gly Ser Gly Ser Arg Thr Asp Phe Thr Leu Thr Ile Asn
65 70 75 80

Pro Val Glu Ala Asp Asp Val Ala Thr Tyr Tyr Cys Gln Gln Ser Asn
85 90 95

Glu Asp Pro Tyr Thr Phe Gly Ala Gly Thr Lys Leu Glu Ile Lys Arg
100 105 110

<210> 79
<211> 107
<212> PRT
<213> Artificial

<220>
<223> single chain antibody

<400> 79

Asp Ile Glu Leu Thr Gln Ser Pro Ala Ile Met Ser Ala Ser Pro Gly
1 5 10 15

Glu Lys Val Ile Met Thr Cys Ser Ala Ser Ser Ser Val Ser Tyr Met
20 25 30

His Trp Tyr Gln Gln Lys Ser Gly Thr Ser Pro Lys Arg Trp Ile Tyr
35 40 45

Asp Thr Ser Lys Leu Ala Ser Gln Val Pro Ala Arg Phe Ser Gly Ser
50 55 60

Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser Ser Met Glu Ala Glu
65 70 75 80

Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Trp Ser Ser Asn Pro Leu Thr
85 90 95

Phe Gly Ala Gly Thr Lys Leu Glu Leu Lys Arg
100 105

<210> 80
<211> 107
<212> PRT
<213> Artificial

<220>
<223> single chain antibody

<400> 80

Asp Ile Glu Leu Thr Gln Ser Pro Ala Ile Met Ser Ala Ser Pro Gly
1 5 10 15

Glu Lys Val Ile Met Thr Cys Ser Ala Ser Ser Ser Val Ser Tyr Met
20 25 30

His Trp Tyr Gln Gln Lys Ser Gly Thr Ser Pro Lys Arg Trp Ile Tyr
35 40 45

Asp Thr Ser Lys Leu Ala Ser Gln Val Pro Ala Arg Phe Ser Gly Ser
50 55 60

Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser Ser Met Glu Ala Glu
65 70 75 80

Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Trp Ser Ser Asn Pro Leu Thr
85 90 95

Phe Gly Ala Gly Thr Lys Leu Glu Leu Lys Arg
100 105

<210> 81
<211> 112
<212> PRT
<213> Artificial

<220>
<223> single chain antibody

<400> 81

Asp Ile Glu Leu Thr Gln Ser Pro Ala Ser Leu Ala Val Ser Leu Gly
1 5 10 15

Gln Arg Ala Thr Ile Ser Cys Arg Ala Ser Glu Ser Val Asp Ser Tyr
20 25 30

Gly Asn Ser Phe Met Gly Trp Tyr Gln Gln Lys Pro Gly Gln Pro Pro
35 40 45

Lys Leu Leu Ile Tyr Leu Ala Ser Asn Leu Glu Ser Gly Val Pro Ala
50 55 60

Arg Phe Ser Gly Ser Gly Ser Arg Thr Asp Phe Thr Leu Thr Ile Asp
65 70 75 80

Pro Val Glu Ala Asp Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Trp Ser
85 90 95

Ser Tyr Pro Phe Thr Phe Gly Ser Gly Thr Lys Leu Glu Leu Lys Arg
100 105 110

<210> 82
<211> 112
<212> PRT
<213> Artificial

<220>
<223> single chain antibody

<400> 82

Asp Ile Glu Leu Thr Gln Ser Pro Thr Ser Leu Ala Val Ser Leu Gly
1 5 10 15

Gln Arg Ala Thr Ile Ser Cys Arg Ala Ser Glu Ser Val Asp Ser Tyr
20 25 30

Gly Asn Ser Phe Met His Trp Tyr Gln Gln Lys Pro Gly Gln Pro Pro
35 40 45

Lys Leu Leu Ile Tyr Leu Ala Ser Asn Leu Glu Ser Gly Val Pro Ala
50 55 60

Arg Phe Ser Gly Ser Gly Ser Arg Thr Asp Phe Thr Leu Thr Ile Asp
65 70 75 80

Pro Val Glu Ala Asp Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Tyr Ser
85 90 95

Gly Tyr Pro Leu Thr Phe Gly Ser Gly Thr Lys Leu Glu Leu Lys Arg
100 105 110

<210> 83
<211> 112
<212> PRT
<213> Artificial

<220>
<223> single chain antibody

<400> 83

Asp Ile Glu Leu Thr Gln Ser Pro Ala Ser Leu Ala Val Ser Leu Gly
1 5 10 15

Arg Arg Ala Thr Ile Ser Cys Arg Ala Ser Glu Ser Val Asp Ser Tyr
20 25 30

Gly His Ser Phe Met His Trp Tyr Gln Gln Lys Pro Gly Gln Pro Pro
35 40 45

Lys Leu Leu Ile Tyr Leu Ala Ser Asn Leu Glu Ser Gly Val Pro Ala
50 55 60

Arg Phe Ser Gly Ser Gly Ser Arg Thr Asp Phe Thr Leu Thr Ile Asp
65 70 75 80

Pro Val Glu Ala Asp Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Trp Ser
85 90 95

Ser Tyr Pro Leu Thr Phe Gly Ser Gly Thr Lys Leu Glu Leu Lys Arg
100 105 110

<210> 84
<211> 112
<212> PRT
<213> Artificial

<220>
<223> single chain antibody

<400> 84

Asp Ile Glu Leu Thr Gln Ser Pro Ala Ser Leu Ala Val Ser Leu Gly
1 5 10 15

Gln Arg Ala Thr Ile Ser Cys Arg Ala Ser Glu Ser Val Asp Ser Tyr
20 25 30

Gly His Ser Phe Met Gln Trp Tyr Gln Gln Lys Pro Gly Gln Pro Pro
35 40 45

Lys Leu Leu Ile Tyr Arg Ala Ser Asn Leu Glu Pro Gly Ile Pro Ala
50 55 60

Arg Phe Ser Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Asn
65 70 75 80

Pro Val Glu Ala Asp Asp Val Ala Thr Tyr Tyr Cys Gln Gln Trp Ser
85 90 95

Ser Tyr Pro Leu Thr Phe Gly Ser Gly Thr Lys Leu Glu Leu Lys Arg
100 105 110

<210> 85
<211> 107
<212> PRT
<213> Artificial

<220>
<223> single chain antibody

<400> 85

Asp Ile Glu Leu Thr Gln Ser Pro Ala Ile Met Ser Ala Ser Pro Gly
1 5 10 15

Glu Lys Val Thr Thr Cys Ser Ala Ser Ser Ser Val Ser Tyr Met
20 25 30

Gly Trp Phe Gln Gln Lys Pro Gly Thr Ser Pro Lys Leu Trp Ile Tyr
35 40 45

Ser Thr Ser Asn Leu Ala Ser Gly Val Pro Ala Arg Phe Ser Gly Ser
50 55 60

Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser Arg Met Glu Ala Glu
65 70 75 80

Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Ser Asn Glu Asp Pro Pro Thr
85 90 95

Phe Gly Ser Gly Asp Gln Ala Gly Asn Lys Ser
100 105

<210> 86
<211> 112
<212> PRT
<213> Artificial

<220>
<223> single chain antibody

<400> 86

Asp Ile Glu Leu Thr Gln Ser Pro Ala Ile Met Ser Ala Ser Pro Gly
1 5 10 15

Glu Lys Val Thr Thr Cys Arg Ala Ser Glu Ser Val Asp Ser Tyr
20 25 30

Gly His Ser Phe Met Gln Trp Phe Gln Gln Lys Pro Gly Thr Ser Pro
35 40 45

Lys Leu Trp Ile Tyr Ser Thr Ser Asn Leu Ala Ser Gly Val Pro Ala
50 55 60

Arg Phe Ser Gly Ser Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser
65 70 75 80

Arg Met Glu Ala Glu Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Ser Asn
85 90 95

Glu Asp Pro Tyr Thr Phe Gly Ser Gly Asp Gln Ala Gly Asn Lys Arg
100 105 110

<210> 87
<211> 107
<212> PRT
<213> Artificial

<220>
<223> single chain antibody

<400> 87

Asp Thr Glu Leu Thr Gln Ser Pro Ala Ile Met Ser Ala Ser Pro Gly
1 5 10 15

Glu Lys Val Thr Thr Cys Ser Ala Ser Ser Ser Val Ser Tyr Met
20 25 30

Tyr Trp Tyr Gln Gln Lys Pro Gly Ser Ser Pro Arg Leu Leu Ile Tyr
35 40 45

Asp Thr Ser Asn Leu Ala Ser Gly Val Pro Val Arg Phe Ser Gly Ser
50 55 60

Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser Arg Met Glu Ala Glu
65 70 75 80

Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Trp Ser Ser Asn Pro Leu Thr
85 90 95

Phe Gly Ser Gly Thr Lys Leu Glu Leu Lys Arg
100 105

<210> 88
<211> 109
<212> PRT
<213> Artificial

<220>
<223> single chain antibody

<400> 88

Asp Ile Glu Leu Thr Gln Ser Pro Ala Ile Met Ser Ala Ser Pro Gly
1 5 10 15

Glu Lys Val Thr Thr Cys Arg Ala Ser Ser Ser Val Ser Ser Ser
20 25 30

Tyr Leu Gly Trp Tyr Gln Gln Lys Pro Gly Ser Ser Pro Arg Leu Leu
35 40 45

Ile Tyr Asp Thr Ser Asn Leu Ala Ser Gly Val Pro Val Arg Phe Ser
50 55 60

Gly Ser Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser Arg Met Glu
65 70 75 80

Ala Glu Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Trp Ser Ser Asn Pro
85 90 95

Leu Thr Phe Gly Ser Gly Thr Lys Leu Glu Leu Lys Arg
100 105

<210> 89
<211> 109
<212> PRT
<213> Artificial

<220>
<223> single chain antibody

<400> 89

Asp Ser Glu Leu Thr Gln Ser Pro Thr Thr Met Ala Ala Ser Pro Gly
1 5 10 15

Glu Lys Ile Thr Thr Cys Ser Ala Ser Ser Ser Ile Ser Ser Asn
20 25 30

Tyr Leu His Trp Tyr Gln Gln Arg Pro Gly Phe Ser Pro Lys Leu Leu
35 40 45

Ile Tyr Arg Thr Ser Asn Leu Ala Ser Gly Val Pro Ala Arg Phe Ser
50 55 60

Gly Ser Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Gly Thr Met Glu
65 70 75 80

Ala Glu Asp Val Ala Thr Tyr Tyr Cys Gln Gln Gly Ser Ser Ile Pro
85 90 95

Arg Thr Phe Gly Gly Thr Lys Leu Glu Ile Lys Arg
100 105

<210> 90
<211> 111
<212> PRT
<213> Artificial

<220>
<223> single chain antibody

<400> 90

Asp Ile Glu Leu Thr Gln Ser Pro Ala Ser Leu Ala Val Ser Leu Gly
1 5 10 15

Arg Arg Ala Thr Thr Ser Cys Arg Ala Ser Glu Ser Val Glu Tyr Tyr
20 25 30

Gly Thr Ser Leu Met Gln Trp Tyr Gln Gln Lys Pro Gly Gln Pro Pro
35 40 45

Lys Leu Leu Ile Tyr Ala Ala Ser Asn Val Glu Ser Gly Val Pro Ala
50 55 60

Arg Phe Ser Gly Ser Gly Thr Asp Phe Ser Leu Asn Ile His
65 70 75 80

Pro Val Glu Glu Asp Ile Ala Met Tyr Phe Cys Gln Gln Ser Arg Lys
85 90 95

Val Pro Trp Thr Phe Gly Gly Thr Lys Leu Glu Ile Lys Arg
100 105 110

<210> 91
<211> 112
<212> PRT
<213> Artificial

<220>
<223> single chain antibody

<400> 91

Tyr Ile Glu Leu Thr Gln Ser Pro Ala Ser Leu Ala Val Ser Leu Gly
1 5 10 15

Gln Arg Ala Thr Thr Ser Cys Arg Ala Ser Glu Ser Val Asp Ser Tyr
20 25 30

Gly Asn Ser Phe Met His Trp Tyr Gln Gln Lys Pro Gly Gln Pro Pro
35 40 45

Lys Leu Leu Ile Tyr Leu Ala Ser Asn Leu Glu Ser Gly Val Pro Ala
50 55 60

Arg Phe Ser Gly Ser Gly Ser Arg Thr Asp Phe Thr Leu Thr Ile Asp
65 70 75 80

Pro Val Glu Ala Asp Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Asn Asn
85 90 95

Glu Asp Pro Tyr Thr Phe Gly Gly Thr Lys Leu Glu Ile Lys Ser
100 105 110

<210> 92
<211> 112
<212> PRT
<213> Artificial

<220>
<223> single chain antibody

<400> 92

Asp Ile Glu. Leu Thr Gln Ser Pro Ala Ser Leu Ala Val Ser Leu Gly
1 5 10 15

Gln Arg Ala Thr Thr Ser Cys Arg Ala Ser Glu Ser Val Glu Tyr Tyr
20 25 30

Gly Thr Ser Leu Met Gln Trp Tyr Gln Gln Lys Pro Gly Gln Pro Pro
35 40 45

Lys Leu Leu Ile Tyr Ala Ala Ser Asn Val Glu Ser Gly Ala Pro Ala
50 55 60

Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Ser Leu Asn Ile His
65 70 75 80

Pro Val Glu Glu Asp Asp Ile Ala Met Tyr Phe Cys Gln Gln Ser Arg
85 90 95

Lys Val Pro Tyr Thr Phe Gly Gly Thr Lys Leu Glu Ile Lys Arg
100 105 110

<210> 93
<211> 109
<212> PRT
<213> Artificial

<220>
<223> single chain antibody

<400> 93

Asp Ile Glu Leu Thr Gln Ser Pro Ala Ile Met Ser Ala Ser Pro Gly
1 5 10 15

Glu Lys Val Thr Thr Cys Ser Val Ser Ser Ser Ile Ser Ser Ser
20 25 30

Asn Leu His Trp Tyr Gln Gln Lys Ser Gly Thr Ser Pro Lys Leu Trp
35 40 45

Ile Tyr Gly Thr Ser Asn Leu Ala Ser Gly Val Pro Val Arg Phe Ser
50 55 60

Gly Ser Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Ser Ser Met Glu
65 70 75 80

Ala Glu Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Trp Ser Ser Tyr Pro
85 90 95

Leu Thr Phe Gly Ala Gly Thr Lys Val Glu Leu Arg Arg
100 105

<210> 94
<211> 109
<212> PRT
<213> Artificial

<220>
<223> single chain antibody

<400> 94

Asp Ile Glu Leu Thr Gln Ser Pro Ala Ser Met Ser Ala Ser Pro Gly
1 5 10 15

Glu Lys Val Thr Met Thr Cys Arg Ala Thr Ser Ser Val Ser Ser Ser
20 25 30

Tyr Leu His Trp Tyr Gln Gln Lys Ser Gly Ala Ser Pro Lys Leu Trp
35 40 45

Ile Tyr Ser Ala Ser Asn Leu Ala Ser Gly Val Pro Ser Arg Phe Ser
50 55 60

Gly Ser Gly Ser Gly Thr Ser Tyr Leu Ser Thr Ile Ser Ser Val Glu
65 70 75 80

Ala Glu Asp Ala Ala Thr Tyr Tyr Cys Gln Gln Tyr Ile Gly Tyr Pro
85 90 95

Tyr Thr Phe Gly Gly Thr Lys Leu Glu Ile Lys Arg
100 105

<210> 95
<211> 109
<212> PRT
<213> Artificial

<220>
<223> single chain antibody

<400> 95

Asp Ile Glu Leu Thr Gln Ser Pro Thr Thr Met Ala Ala Ser Pro Gly
1 5 10 15

Glu Lys Ile Thr Ile Thr Cys Ser Ala Ser Ser Ser Ile Gly Ser Asn
20 25 30

Tyr Leu His Trp Tyr Gln Gln Lys Pro Gly Phe Ser Pro Lys Leu Leu
35 40 45

Ile Tyr Lys Thr Ser Asn Leu Ala Ser Gly Val Pro Ala Arg Phe Ser
50 55 60

Gly Ser Gly Ser Gly Thr Ser Tyr Ser Leu Thr Ile Gly Ala Val Glu
65 70 75 80

Ala Glu Asp Val Ala Thr Tyr Tyr Cys Gln Gln Gly Ser Ser Ile Pro
85 90 95

Tyr Thr Phe Gly Gly Thr Lys Leu Glu Ile Lys Arg
100 105

<210> 96
<211> 36
<212> DNA
<213> Artificial

<220>
<223> oligonucleotide primer

<400> 96
gtctcctgag ctagctgagg agacggtgac cgtggt

36

<210> 97
<211> 42
<212> DNA
<213> Artificial

<220>
<223> oligonucleotide primer

<400> 97
gtaccaacgc gtgtcttgtc ccaggtccag ctgcaggagt ct

42

<210> 98
<211> 42
<212> DNA
<213> Artificial

<220>
<223> oligonucleotide primer

<400> 98
gtaccaacgc gtgtcttgtc ccaggtgaag ctgcagcagt ca

42

<210> 99
<211> 42
<212> DNA
<213> Artificial

<220>
<223> oligonucleotide primer

<400> 99
gtaccaacgc gtgtcttgtc ccaggtgcag ctggtgcaat ct

42

<210> 100
<211> 54
<212> DNA
<213> Artificial

<220>
<223> oligonucleotide primer

<400> 100
tcagtcgttg catgtactcc aggtgcacga tgtgacatcg agtcactca gtct 54

<210> 101
<211> 36
<212> DNA
<213> Artificial

<220>
<223> oligonucleotide primer

<400> 101
ctggaaatca aacgtacgtt ttatttccag cttgg 36

<210> 102
<211> 54
<212> DNA
<213> Artificial

<220>
<223> oligonucleotide primer

<400> 102
tcagtcgttg catgtactcc aggtgcacga tgtgacatcg agtcactca gtct 54

<210> 103
<211> 36
<212> DNA
<213> Artificial

<220>
<223> oligonucleotide primer

<400> 103
ctggaaatca aacgtacgtt tgatttccag cttgg 36

<210> 104
<211> 54
<212> DNA
<213> Artificial

<220>
<223> oligonucleotide primer

<400> 104
tcagtcgttg catgtactcc aggtgcacga tgtgacatcg tgatgaccca gtct 54

<210> 105

<211> 36
<212> DNA
<213> Artificial

<220>
<223> oligonucleotide primer

<400> 105 ctggaaatca aacgtacgtt ttatctccag cttggc 36

<210> 106
<211> 5
<212> PRT
<213> Artificial

<220>
<223> single chain antibody fragment

<400> 106

Gly Arg Gly Val Asn
1 5

<210> 107
<211> 9
<212> PRT
<213> Artificial

<220>
<223> single chain antibody fragment

<400> 107

Asn Gly Asp Pro Glu Ala Phe Asp Tyr
1 5

<210> 108
<211> 10
<212> PRT
<213> Artificial

<220>
<223> single chain antibody fragment

<400> 108

Ala Leu Gln Ser Asp Ser Pro Tyr Phe Asp
1 5 10

<210> 109
<211> 10
<212> PRT
<213> Artificial

<220>
<223> single chain antibody fragment

<400> 109

Asp Leu Ala Ile Phe Ala Gly Asn Asp Tyr
1 5 10

<210> 110
<211> 11
<212> PRT
<213> Artificial

<220>
<223> single chain antibody fragment

<400> 110

Val Gly Val Asp Arg Trp Tyr Pro Ala Asp Tyr
1 5 10

<210> 111
<211> 12
<212> PRT
<213> Artificial

<220>
<223> single chain antibody fragment

<400> 111

Asp Leu Leu Asp Gly Ser Gly Ala Tyr Phe Asp Tyr
1 5 10

<210> 112
<211> 13
<212> PRT
<213> Artificial

<220>
<223> single chain antibody fragment

<400> 112

Asp Leu Asp Tyr Gly Gly Asn Ala Gly Tyr Phe Asp Leu
1 5 10

<210> 113
<211> 13
<212> PRT
<213> Artificial

<220>
<223> single chain antibody fragment
<400> 113

Asp Leu Asp Tyr Gly Gly Asn Ala Gly Tyr Phe Asp Leu
1 5 10

<210> 114
<211> 13
<212> PRT
<213> Artificial

<220>
<223> single chain antibody fragment
<400> 114

Asp Tyr Thr Ala Asn Tyr Tyr Tyr Tyr Gly Met Asp Val
1 5 10

<210> 115
<211> 15
<212> PRT
<213> Artificial

<220>
<223> single chain antibody fragment
<400> 115

Asp Leu Gly Tyr Gly Ser Gly Thr Ser Ser Tyr Tyr Leu Asp Tyr
1 5 10 15

<210> 116
<211> 9
<212> PRT
<213> Artificial

<220>
<223> single chain antibody fragment
<400> 116

Gln Gln Ala Asn Ser Phe Pro Arg Thr
1 5

<210> 117
<211> 8
<212> PRT
<213> Artificial

<220>

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Leu Gln Asp Tyr Asn Gly Trp Thr
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Asn Ser Arg Asp Ser Ser Gly Asn His Val Val
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Lys Ser Arg Asp Ser Arg Gly Asn His Leu Ala Leu
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Gln Gln Tyr His Thr Ile Ser Arg Thr
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Asn Ser Arg Asp Ser Ser Gly Asn His Val Val
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Asn Ser Arg Asp Ser Ser Gly Asn His Gln Val
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Asn Ser Arg Asp Ser Ser Gly Val Val
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Asn Ser Arg Asp Ser Ser Gly Asn His Val Val
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<400> 126

Leu Ala Thr Tyr Tyr Phe Gly Leu Asp Val
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Leu Ala Thr Tyr Tyr Phe Gly Leu Asp Val
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<400> 128

Gly Pro Trp Glu Leu Val Gly Tyr Phe Asp Ser
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<400> 129

Glu Pro Asp Trp Leu Leu Trp Gly Asp Arg Gly Ala Leu Asp Val
1 5 10 15

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<400> 130

Glu Pro Asp Trp Leu Leu Trp Gly Asp Arg Gly Ala Leu Asp Val
1 5 10 15

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Glu Pro Asp Trp Leu Leu Trp Gly Asp Arg Gly Ala Leu Asp Val
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Gln Gln Tyr Asn Ser Tyr Val Tyr Thr
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Gln Gln Leu Asn Ser Tyr Pro Leu Thr
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Gln Gln Leu Ile Ser Tyr Pro Leu Thr
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Gln His Tyr Asn Thr Tyr Pro Tyr Thr
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Gln His Tyr Asn Thr Tyr Pro Tyr Thr
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Gln His Tyr Asn Thr Tyr Pro Tyr Thr

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Asp Tyr Tyr Met Tyr
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Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val Ala
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Thr Ile Ser Asp Gly Gly Ser Tyr Thr Tyr Tyr Pro Asp Ser Val Lys
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Gly

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Gln Val Gln Leu Gln Glu Ser Gly Gly Leu Val Gln Pro Gly Gly
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Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser
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Asp Tyr Tyr Met Tyr
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Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val Ala
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Thr Ile Ser Asp Gly Gly Ser Tyr Thr Tyr Tyr Pro Asp Ser Val Lys
1 5 10 15

Gly

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Gln Val Gln Leu Gln Glu Ser Gly Gly Leu Val Gln Pro Gly Gly
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Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser
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Asp His Tyr Met Tyr
1 5

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Gly

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Gln Val Gln Leu Gln Glu Ser Gly Gly Leu Val Gln Pro Gly Gly
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Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Ser Ser
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Asp His Tyr Met Tyr
1 5

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Thr Ile Ser Asp Gly Gly Ser Tyr Thr Tyr Tyr Pro Asp Ser Val Lys
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Gly

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Gln Val Gln Leu Gln Glu Ser Gly Gly Leu Val Gln Pro Gly Gly
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Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Ser Ser
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Asp His Tyr Met Tyr
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Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val Ala
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Thr Ile Ser Asp Gly Gly Ser Tyr Thr Tyr Tyr Pro Asp Ser Val Lys
1 5 10 15

Gly

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Ser Leu Lys Leu Ser Cys Ala Gly Ser Gly Phe Thr Phe Ser
20 25 30

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Asp Tyr Asp Met His
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Val Met Trp Phe Asp Gly Thr Glu Lys Tyr Ser Ala Glu Ser Val Lys
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Gly

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Ser Leu Lys Leu Ser Cys Ala Gly Ser Gly Phe Thr Phe Ser
20 25 30

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Asp Tyr Asp Met His
1 5

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Val Met Trp Phe Asp Gly Thr Glu Lys Tyr Ser Ala Glu Ser Val Lys
1 5 10 15

Gly

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Ser Leu Lys Leu Ser Cys Ala Gly Ser Gly Phe Thr Phe Ser
20 25 30

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Asp Tyr Asp Met His
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Trp Val Arg Gln Ala Pro Gly Lys Gly Leu Glu Trp Val Ala
1 5 10

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Gly

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Ser Leu Lys Leu Ser Cys Ala Gly Ser Gly Phe Thr Phe Ser
20 25 30

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Asp Tyr Asp Met His
1 5

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Val Met Trp Phe Asp Gly Thr Glu Lys Tyr Ser Ala Glu Ser Val Lys
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Gly

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Ser Leu Arg Leu Ser Cys Ala Ala Ser Gly Phe Thr Phe Ser
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Asn Tyr Ala Met Thr
1 5

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1 5 10

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Ser Ile Ser Val Gly Gly Ser Asp Thr Tyr Tyr Ala Asp Ser Val Lys
1 5 10 15

Gly

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Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr Leu Gln
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Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Met Tyr Tyr Cys Ser Arg
20 25 30

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Tyr Arg Tyr Asp Asp Ala Met Asp Tyr
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Trp Gly Gln Gly Thr Leu Val Thr Val Ser Ser
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Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr Leu Gln
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Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Ile Tyr Tyr Cys Ser Arg
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Tyr Arg Tyr Asp Asp Ala Met Asp Tyr
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Trp Gly Gln Gly Thr Leu Val Thr Val Ser Ser
1 5 10

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Arg Phe Thr Thr Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr Leu Gln
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Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Ile Tyr Tyr Cys Ser Arg
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Tyr Arg Tyr Asp Asp Ala Met Asp Tyr
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Trp Gly Gln Gly Thr Leu Val Thr Val Ser Ser
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Arg Phe Thr Val Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr Leu Gln
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Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Ile Tyr Tyr Cys Ser Arg
20 25 30

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Tyr Arg Tyr Asp Asp Ala Met Asp Tyr
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Trp Gly Gln Gly Thr Leu Val Thr Val Ser Ser
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<400> 190

Arg Phe Thr Thr Ser Arg Asp Asn Ser Lys Asn Thr Leu Tyr Leu Gln
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Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Ile Tyr Tyr Cys Ser Arg
20 25 30

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Trp Gly Gln Gly Thr Leu Val Thr Val Ser Ser
1 5 10

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Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Phe Leu Gln
1 5 10 15

Met Asn Ser Leu Arg Ala Asp Asp Thr Ala Val Tyr Tyr Cys Ala Arg
20 25 30

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Glu Pro Asp Trp Leu Leu Trp Gly Asp Arg Gly Ala Leu Asp Val
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Trp Gly Gln Gly Thr Thr Val Thr Val Ser Ser
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Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Phe Leu Gln
1 5 10 15

Met Asn Ser Leu Arg Ala Asp Asp Thr Ala Val Tyr Tyr Cys Ala Arg
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Glu Pro Asp Trp Leu Leu Trp Gly Asp Arg Gly Ala Leu Asp Val
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Trp Gly Gln Gly Thr Thr Val Thr Val Ser Ser
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Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Phe Leu Gln
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Met Asn Ser Leu Arg Ala Asp Asp Thr Ala Val Tyr Tyr Cys Ala Arg
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Trp Gly Gln Gly Thr Thr Val Thr Val Ser Ser
1 5 10

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Arg Phe Thr Ile Ser Arg Asp Asn Ser Lys Asn Thr Leu Phe Leu Gln
1 5 10 15

Met Asn Ser Leu Arg Ala Asp Asp Thr Ala Val Tyr Tyr Cys Ala Arg

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Trp Gly Gln Gly Thr Thr Val Thr Val Ser Ser
1 5 10

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Arg Phe Thr Val Ser Arg Asp Asn Ser Lys Asn Thr Leu Leu Leu Gln
1 5 10 15

Met Asn Ser Leu Arg Ala Glu Asp Thr Ala Val Tyr Tyr Cys Ala Lys
20 25 30

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Val Arg Thr Lys Tyr Cys Ser Ser Leu Ser Cys Phe Ala Gly Phe Asp
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Ser

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Glu Arg Ala Thr Ile Ser Cys
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<400> 209

Arg Ala Ser Glu Ser Val Asp Ser Tyr Gly His Ser Phe Met Gln
1 5 10 15

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Arg Ala Ser Asn Leu Glu Pro
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Glu Ile Val Leu Thr Gln Ser Pro Ala Thr Leu Ser Leu Ser Pro Gly
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Glu Arg Ala Thr Ile Ser Cys
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Arg Ala Ser Glu Ser Val Asp Ser Tyr Gly His Ser Phe Met Gln
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Trp Tyr Gln Gln Lys Pro Gly Gln Ala Pro Arg Leu Leu Ile Tyr
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Glu Arg Ala Thr Ile Ser Cys
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Arg Ala Ser Glu Ser Val Asp Ser Tyr Gly His Ser Phe Met Gln
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Arg Ala Ser Asn Leu Glu Pro
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Arg Ala Ser Glu Ser Val Asp Ser Tyr Gly His Ser Phe Met Gln
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Arg Ala Ser Asn Leu Glu Pro
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Arg Ala Ser Asn Leu Glu Pro
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Asp Ile Val Met Thr Gln Ser Pro Ser Thr Leu Ser Ala Ser Val Gly
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Asp Arg Val Thr Ile Thr Cys
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Arg Ala Ser Gln Ser Ile Ser Ser Trp Leu Ala
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Asp Arg Val Thr Ile Thr Cys

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Asp Arg Val Thr Ile Thr Cys
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Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Met Tyr
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Gly Ala Ser Ser Leu Gly Ser
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Asp Arg Val Thr Ile Thr Cys
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Glu Ala Ser Ser Leu Gly Arg
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Asp Arg Val Thr Ile Thr Cys
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Trp Tyr Gln Gln Lys Pro Gly Lys Ala Pro Lys Leu Leu Ile Tyr
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Ala Ala Ser Ser Leu Gln Ser
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Gln His Tyr Asp Thr Tyr Pro Tyr Thr
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